

Protect Your Property, Home or Business from Disaster

<http://www.fema.gov/plan/prevent/howto/index.shtm>

Prevent Disaster Losses

<http://www.fema.gov/plan/prevent/index.shtm#0>

What is Retrofitting?

Retrofitting is making changes to an existing building to protect it from flooding or other hazards such as high winds and earthquakes. You may be wondering why retrofitting is necessary. Why aren't houses and other buildings constructed in such a way that they won't need these changes?

One reason is that construction technology, including methods and materials, continues to improve, as does our knowledge of hazards and their effects on buildings. Many houses existing today were built when little was known about where and how often floods and other hazardous events would occur or how buildings should be protected. As a result, retrofitting has become a necessary and important tool to reduce the risk to property and lives.

The Homeowner's Guide to Retrofitting: Six Ways to Protect Your House From Flooding This book explains how each retrofitting method works and where it should and should not be used, lists its advantages and disadvantages, and provides a cost estimate. [*The Homeowner's Guide to Retrofitting: Six Ways to Protect Your House From Flooding*](#) is downloadable or available at the Wichita-Sedgwick County Metropolitan Area Planning Department, City Hall, 10th Floor located at 455 N Main, Wichita, Kansas 67202.

Cost and Cost Savings

In general, you will find that the cost of retrofitting increases as your Flood Protection Elevation (FPE) increases. For example, protecting your house to the elevation of the 50-year flood with one of the methods described in this guide will probably cost you less than protecting it to the Base Flood Elevation with the same method. Although using a lower FPE may result in a less expensive retrofitting project, it exposes your house to a greater risk of flood damage. So in choosing an FPE, you must consider not only how much you are willing to pay, but also the level of risk you are willing to accept, including the potential damage, financial loss, and emotional distress.

Regardless of the FPE you choose or are required to use, you must realize that a larger flood is always possible and that there will always be some risk of damage. If you don't have flood insurance, you should purchase a policy; if you have flood

insurance, you should maintain your policy, even if you have protected your house to or above the BFE. Once a house has been retrofitted to meet the National Flood Insurance Program (NFIP) requirements for substantially improved structures, it will probably be eligible for a significantly lower flood insurance rate.

Freeboard

Freeboard is an additional amount of height included in the FPE to provide a factor of safety. If you are protecting your house by elevating it, wet floodproofing it, dry floodproofing it, or building a levee or floodwall, you should include a minimum of 1-2 foot of freeboard in your FPE. For example, if you are elevating your house to protect it from the base flood, your FPE should be equal to the BFE plus 1 foot.

Freeboard is needed because of uncertainties regarding expected flood elevations. These uncertainties exist for several reasons, but the primary reasons are limitations of the analytical methods used in floodplain studies and potential effects of future watershed development, such as the construction of buildings and roads.

FEMA and all other agencies that perform floodplain studies use a variety of standard engineering methodologies to determine flood frequencies and flood elevations. These methods involve the use of historical data, field measurements, and assumptions and judgments, all of which can affect the accuracy of the results. Some amount of uncertainty regarding the results is therefore unavoidable, and the potential for flood elevations higher than those expected should always be accounted for in retrofitting.

Development in a watershed can increase the size and frequency of floods in that watershed. In general, watershed development reduces the amount of open ground available to absorb water from rain and melting snow and therefore increases the amount of water that makes its way into streams. As a result, in a developing watershed, an amount of rainfall that might have caused minor floods in the past may cause larger floods, and higher elevations, in the future.

The Basic Retrofitting Methods

Click on any of the methods below to direct you to more detailed information:

- [Build with Flood-Resistant Materials](#)
- [Add Waterproof Veneer to Exterior Walls](#)
- [Dry Floodproof Your Building](#)
- [Install Sewer Backflow Valves](#)
- [Raise Electrical System Components](#)
- [Raise or Floodproof HVAC Equipment](#)
- [Anchor Fuel Tanks](#)
- [Protect Wells from Contamination by Flooding](#)

Other Retrofitting Methods

- [Elevation](#) - Raising your house so that the lowest floor is above the flood level.
- [Wet Floodproofing](#) - Making uninhabited portions of your house resistant to flood damage and allowing water to enter during flooding
- [Relocation](#) - Moving your house out of the floodplain to higher ground where it will not be exposed to flooding
- [Dry Floodproofing](#) - Sealing your house to prevent flood waters from entering
- [Levees and Floodwalls](#) - Building a floodwall or levee around your house to hold back flood water.
- [Demolition](#) - Tearing down your damaged structure and either rebuilding properly on the same property or buying or building a house elsewhere.

Please refer to the following document for details about each method: [*The Homeowner's Guide to Retrofitting: Six Ways to Protect Your House From Flooding*](#) explains how each retrofitting method works and where it should and should not be used, lists its advantages and disadvantages, and provides a cost estimate.

WARNING: But first, there are some general cautions about retrofitting that you need to be aware of. In areas listed below, the hazards to lives and property are usually greater than in other floodprone areas:

- Floodways - shown on a FIRM
- Alluvial fan flood hazard areas (Zone AO with depths and velocities) shown on a FIRM
- Areas subject to flash floods
- Areas subject to ice flows
- Area subject to extremely high velocity flood flows

Modifying a house to protect it from flood damage in these areas requires extreme care and may also require complex, engineered designs. If your house is in one of these areas, you should consider relocation or demolition rather than any of the other retrofitting methods. If you have any doubt about whether your house is in an area of unusually severe hazard, consult your local officials.